

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554**

In the Matter of)	
)	
Commission Seeks)	
Public Comment on)	ET Docket No. 02-135
Spectrum Policy Task Force)	
Report)	

COMMENTS OF QUALCOMM INCORPORATED

QUALCOMM Incorporated hereby submits these comments in response to the Commission's Public Notice ("Notice") seeking public comment on the Spectrum Policy Task Force ("SPTF") Report ("the Report"), ET Docket No. 02-135 (rel. Nov. 25, 2002).

QUALCOMM applauds the Commission and the SPTF for launching this important initiative to review ways in which to improve the way that spectrum is managed in the United States. As Chairman Powell and the SPTF noted, there is an increasing demand for spectrum as new wireless technologies and applications are developed. A periodic review of how spectrum is currently used and of ways in which its use could be improved should benefit the public interest both in terms of ensuring spectral-efficiency and rapid deployment of innovative technologies and services.

QUALCOMM is a leader in the development of Code Division Multiple Access ("CDMA") technology, which has been licensed to over 95 leading communications manufacturers worldwide. Due to its unsurpassed voice quality, system capacity, privacy and flexibility, CDMA has been recognized by the International Telecommunication Union (ITU) as the global standard for next-generation, digital wireless communications products and services, also known as IMT-2000. The Commission's forward-thinking spectrum policies of the late 1980s and early 1990s, which provided commercial mobile radio licensees with flexible service rules and the right to choose their preferred wireless technology, paved the way for the early

introduction and ongoing development of CDMA. Today, the United States is one of the first countries in the world to benefit from the introduction of CDMA-based IMT-2000 services, demonstrating that the Commission's flexible use policies promote the introduction of advanced wireless technologies, devices, and services.

As the Commission seeks to encourage the introduction of new wireless technologies and services, its twin goals of encouraging "technologically innovative and economically efficient spectrum use" can be best met through an extension of its flexible use policies. However, balanced against these two important goals is the protection of existing services and spectrum usage rights. In its efforts to expand its flexible and market-oriented policies, the Commission should work to incorporate empirical methods to determine the impact of the introduction of new technologies or regulatory models on existing services. By implementing a checks-and-balances system, the FCC can find an appropriate balance that provides market opportunities for innovative systems and services while simultaneously protecting existing systems from interference from unproven technologies and applications.

QUALCOMM's comments on specific proposals from the SPTF Report will focus on three general areas: 1) technological advances enabling changes in the Commission's spectrum policy, 2) methods for determining the impact of the introduction of new technologies on existing services, and 3) techniques for minimizing interference and/or promoting access to spectrum. Each of these subjects will be addressed below.

1) Technology advances enabling changes in spectrum policy

QUALCOMM agrees with the SPTF that ongoing advances in technology are an important consideration when reviewing opportunities for changes in spectrum management policy. QUALCOMM also agrees that, "advances in technology have significantly increased the diversity of service offerings and have also qualitatively improved existing services." Recent developments in the commercial mobile radio service industry are an excellent example. Only ten years ago, mobile services were limited to basic voice and low-speed (9.6 kbps) data applications. Today, wireless operators are upgrading those systems with the latest developments in technology, e.g. IMT-2000, which more than double voice capacity and enable the provision of data services at rates of 2.4 Mbps, enabling a broad range of innovative applications. While major increases in demand for these services may necessitate the availability of additional spectrum, it is nevertheless important to note that these dramatic changes in service

offerings are taking place in the same spectrum that was made available to operators nearly a decade ago. As mentioned above, it was the Commission's policy decision from 1989 that permitted mobile operators to select their wireless access technology that facilitated the development and introduction of these new technologies and resultant services. That change in policy accurately reflected "the increasingly dynamic and innovative spectrum use" in the commercial mobile radio arena, and has proved to be a successful example of sound spectrum policy.

That being said, QUALCOMM recommends that the Commission carefully consider the impact of new technology advances and their potential for enabling additional policy changes. For example, the SPTF Report makes several references to "software-defined radios" (SDRs) as a significant technological advancement that will enable more intensive spectrum usage. The Report indicates that SDR technology enables wireless devices to sense their operational environment, react to that environment, and change their modulation scheme and/or operating frequency accordingly. Many of the SPTF's recommendations for spectrum policy changes assume that the implementation of these capabilities will enable the introduction of new technologies in occupied frequencies without causing interference to existing services.

QUALCOMM would like to comment on these assumptions and offer some clarification regarding SDRs. SDR is an often over-used term to describe any type of "smart" or "opportunistic" technology that can dynamically react to its environment. In reality, SDR is merely one method of implementing dynamic capabilities into a radio – a complex, expensive and power dependent method. There are a number of alternative methods for implementing these capabilities into wireless equipment, including multi-mode and multi-band components, which are far less expensive to implement in commercial equipment. When designing equipment, manufacturers are constantly faced with a trade-off between capabilities, costs, and product life cycles. As a result, it is unlikely that SDRs, in the purest sense of the term, will be implemented in commercial equipment. Rather, other techniques to enable frequency and modulation agility will be incorporated into wireless devices.

While QUALCOMM agrees with the SPTF that frequency agility and multi-mode capabilities are currently enabling wireless devices to take advantage of their operating environment, QUALCOMM disagrees with the conclusion that SDRs (and/or frequency agility) alone will in fact enable multiple technologies to utilize the same frequencies by avoiding interfering with one another. Instead, new protocols, modulation schemes and/or etiquettes will

be necessary to support the type of frequency sharing that the SPTF envisions. For example, in the SPTF Report suggests that radios today are capable of sensing their operating environment to determine the amount of traffic in any given frequency range and then decide whether the “interference temperature” is sufficiently low to operate in. It is true that this sensing capability exists. However, it is impossible with today’s technology for the radio to sense the impact that its operations will have on the operations of another radio. The radio cannot “hear” another receiver. Therefore, while the radio can determine whether a given environment is suitable for its own transmission, it cannot sense what impact its transmission will have on other radios operating in that environment. Only through a system with a centralized clearinghouse can one radio predetermine its impact on another radio and modify its operations accordingly.

Given these technological limitations, QUALCOMM recommends that the Commission proceed carefully in modifying its current rules to permit new uses of occupied spectrum. Techniques to increase the capabilities of wireless devices to react to operational environments do exist. However, SDRs are not the solution to the problem of spectrum under-utilization that the SPTF identified in its Report. Rather, it will be necessary to develop entirely new protocols and etiquettes to permit the types of frequency sharing envisioned by the SPTF.

2) Methods to determine impact of new technologies on existing services

In its efforts to find ways to introduce new services and make more efficient use of spectrum, the SPTF recommends that the FCC establish a new quantitative metric, called “interference temperature”, to determine the point at which the use of a particular frequency band is maximized, and under which additional services can share the band. The SPTF encourages the Commission to use this new metric, rather than continue to rely on maximum transmit power and/or in-band and out-of-band emission limits, to determine whether and how users may operate in a band. By introducing this new metric, the SPTF anticipates that new users may be allowed into bands that are currently under-utilized either in time or space.

QUALCOMM would argue that the concept of an interference temperature, while an interesting concept, is not really much different from the requirements imposed upon spectrum users today. In either case, there is a maximum allowable amount of interference that authorized users of a band may cause – the main difference is from what perspective (transmit or receive) the interference is measured. In the final analysis, however, the real issue is not what the metric is called, but rather, how much interference is allowed at any given point in time or space.

Determining what the appropriate level of interference is will depend on the ability to measure what level currently exists, to decide whether more or less should be tolerated, and then to establish the appropriate mechanisms for transitioning to that new level.

QUALCOMM agrees with the recommendations of the SPTF that the Commission investigate the opportunities to create a public/private partnership to determine what interference levels currently exist and explore ways in which that information could be used to take better advantage of the spectrum usage opportunities. However, in the absence of an effective mechanism to measure current levels and determine what impact the addition of new users in a given band will be, such as empirical testing, QUALCOMM is concerned that attempts to change the current levels of acceptable interference to make way for new entrants will likely result in performance degradation for existing services that have designed their equipment to operate under the current interference rules.

Without the ability to perform empirical testing prior to new service authorization, the Commission runs the risks of imposing significant costs on existing services to counter additional interference caused by new users. Therefore, QUALCOMM recommends that the Commission refrain from permitting new users in encumbered bands until the critical issues noted above can be resolved.

3) Techniques for minimizing interference and/or promoting access

In addition to its recommendations on the establishment of an interference temperature, the SPTF also recommended several other methods for minimizing interference and promoting access to spectrum by additional users. These recommendations include: 1) establishing receiver performance standards, 2) allocating contiguous spectrum blocks to services, grouping those with mutually compatible technical characteristics, and co-locating high power transmitters, and 3) permitting secondary market rights.

First, QUALCOMM disagrees with the recommendation that the Commission establish minimum receive performance standards. While receiver performance standards might facilitate improved use of spectrum, they will increase the costs of equipment significantly. One of the benefits of a lack of receiver performance standards is the flexibility it offers equipment designers to develop inexpensive, but nevertheless functional, equipment for certain market segments. Without that flexibility, equipment costs will rise and consumers will suffer from a reduction in affordable options. One alternative to receiver performance standards that the

Commission might want to explore is the establishment of a consumer-testing lab that would be an independent and objective data point for consumers to rely on in making purchasing decisions.

Second, QUALCOMM agrees with the recommendations of the SPTF that the Commission should allocate and assign contiguous spectrum blocks, group services with mutually compatible technical characteristics, and co-locate high-power transmitters. All of these approaches should facilitate the introduction of more efficient technologies as well as spectrum sharing by reducing near-far problems associated with high-power transmitters.

Finally, QUALCOMM strongly agrees with the SPTF recommendation to permit secondary market rights to spectrum, rather than take an easement approach. Providing licensees with exclusive rights as well as flexibility will encourage the most efficient use of spectrum without running the risks described above in connection with establishing new interference levels in the absence of empirical data to demonstrate what is “acceptable”, “minimal” or “harmful” to existing services.

In conclusion, QUALCOMM would like to congratulate the SPTF for its laudable efforts in reviewing a critical component of wireless communications, and for exploring innovative ways in which the Commission can improve its spectrum management practices. QUALCOMM looks forward to working together with the Commission as it seeks to implement the recommendations contained in the SPTF Report, and to finding new solutions to ensure that spectrum is used as efficiently as possible, while avoiding adversely impacting existing services.

Respectfully submitted,

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